

## Periodic Table Tour of the Recycling Center

Grade level: 3-8

### I. (15 min) Metals vs. Non-metals

- Have students observe aluminum can, steel can, aluminum foil, glass of water, plastic bottle, plastic bag, rubber bike tire.
- Use five senses and magnets.
- Which are metals/non-metals?
- What are the characteristics of each group?
- Compare student observations to chart below.

Metals	Non-metals
Strong	Brittle
Sonorous	Dull sound when hit with hammer
High melting and boiling points	Low melting and boiling points
Good conductors of heat and electricity	Poor conductors of heat and electricity
Mainly solids at room temp.	Solids, liquids and gases at room.temp.
Shiny when polished	Dull looking

- Introduce periodic table – locate metals and non-metals

### II. (3 min) What metallic and non-metallic elements are found at the Recycling Center?

Metallic elements found at Recycling Center:	Non-metallic elements found at Recycling Center:
Aluminum (Al) Iron/steel (Fe) Tin (Sn)	Glass (SiO <sub>2</sub> ) Water (H <sub>2</sub> O) Plastic, Paper, Rubber (C, H, O)

### III. (2 min) Why recycle metals?

- Elements are naturally occurring building blocks, but many of them are not easy to extract from the Earth.
- By recycling, we reuse the elements that have already been extracted.
  - This saves energy;
  - saves water;
  - protects habitat;
  - reduces emissions;
  - preserves resources.
- Metals are infinitely recyclable. Once we invest in extracting them, we can keep using them over and over forever. Like Play-doh, [Video link, The Most Sustainable Package.](#) (1:29)

### IV. (10 min) More on Aluminum (Al), Steel (Iron, Fe) and Tin (Sn)

- Aluminum (Al) or Aluminium
  - Identify the recyclable can and foil as Aluminum.
  - Locate Al on the periodic table.

- Aluminum is a natural element, but it is not found alone in nature. It exists in a rock called Bauxite.
- To get bauxite and then aluminum from the Earth, it must be mined.
- Briefly discuss open pit mining process (see slides).
- Discuss benefits of recycling aluminum
  - Requires 95% less energy to make a new can from recycling than from mining.
  - Energy savings from recycling one aluminum can are enough to power a television for 2-3 hours.
  - 4 tons of ore are required to create 1 ton of aluminum
  - 60 days for an aluminum can to go from recycling bin back to the store shelf.
- Steel (made from Iron, Fe)
  - Identify the recyclable steel food can.
  - Steel is carbon-rich, commercial iron.
  - Pure iron is too brittle, steel is iron mixed with a few other components to make it stronger.
  - Iron exists in the Earth as iron ore – the iron metal is separated through heat and chemicals (Carbon and Oxygen) in a process called smelting – simpler than extracting aluminum from bauxite.
  - [Toaster Project](#) excerpt from Steel chapter (p.46-51)
  - Recycling Steel
    - The world’s most recycled material.
    - Requires 56% less energy to make a new item from recycled steel than from new.
- Tin (Sn)
  - Sn is for the Latin word stannum.
  - Identify the recyclable tin-coated steel can.
  - Used in history to make bronze – combined with copper (Cu) to make bronze, which was stronger than pure copper – for weapons.
  - Modern uses:
    - tin coated steel for food cans,
    - wire,
    - solder for electronics,
    - window glass coating
  - Tin foil is actually aluminum.
  - Fun fact: the Oscar award statues are made of 92% tin.
  - [Tin video link.](#) (1:47)

**V. (15-20 min) How can we use the properties of elements at the Recycling Center?**

- Steel (Iron) and Tin are magnetic - ferromagnetism
- Aluminum is non-magnetic –paramagnetism
- Activity: Students to simulate new recycling sorting system – sort steel from aluminum.
- Bonus Activity (if time allows): Eddy Current Separator
  - Even though Aluminum is not attracted to magnets, it can be repelled by them.
  - [Eddy Current Separator video.](#) (00:30)
  - [Eddy Current Demonstration using Aluminum can.](#)